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ORDER MANAGEMENT SYSTEM WITH ENTERPRISE SERVICE BUS IN TELECOMMUNICATION INDUSTRY

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ABSTRACT

Communication is something that is in the need of every people in the world, and as the customers to the telecommunication industries are expecting a good service from the corresponding company. This matter is what drive the telecommunication industries to upgrade their ser-vices to accommodate the orders of the customers. Thus, Service Oriented Architecture (SOA) with the Enterprise Service Bus (ESB) is the solution for the problem, because it is able to be flexible and follows the ever changing business process and needs of the customers. With the micro services, the system will be able to be modified partly on what needs to be added or fixed, it does not require the service to be re-built from scratch. The implementation of the new system based on ESB is a new approach that can be considered for ordering system, the implementation in this case is able to meet the management's expectation of success rate.

Key words: Enterprise Service Bus, Service Oriented Architecture, Microservices, Order Management System, Telecommunication.

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1. INTRODUCTION

All telecommunication companies in Indonesia are currently in very rapid growth, certainly we do not deny the existence of competition between companies in any case, both in terms of price, network quality, and also in terms of service quality to customers. Customers are important aspects that are very necessary to be maintained and accommodated by telecommunication companies. If the company is unable to maintain its customers by providing the best service, then there is a certain possibility of customers will go to other providers to get better services. In an effort to improve services from the side of order management services for customers who are part of Customer Relationship Management (CRM), the company strives to find new solutions that are certainly better, faster, and easier

to carry out maintenance and service modification when needed, of course these things will be very helpful in all operational activities / business processes that exist.

At this time, the company that is used as a case study, their system that is being used is old and difficult in terms of maintenance. This is because the existing system is still in java code, resulting in the difficulty of the company in maintaining and changing functions / modules in the system because it requires overall code replacement. In addition, because the current system often experiences problems and constraints in terms of its operations, it requires the operational team to change data directly from the database side, where such actions are highly discouraged and certainly damage the integrity of existing data, and pose a risk to data manipulation. In the current system, the performance in the order execution is very bad, based on the results of observations and interviews with the user and operational team, it is said that a lot of problems occur because the old system often has problems such as stuck threads / stuck processes so sometimes it must be stopped forcibly by turning off the process so that the data is not updated and must be manually re-placed, where events like this occur every day due to so many transactions that occur at the same time. Based on the information obtained, the occurrence of stuck orders is around 10% of all incoming orders every day and the average daily order is around 10000 orders for each module, of which the order involved and must be repaired is around 1000 orders for each module, of course it will take a lot of time to fix it, be-cause you have to find out first the corrupted data / which must be manually corrected. With limited human resources on the operation-al side, it will certainly be very difficult for the operational team to be able to fulfill the Client's request to be able to correct the entire order in a timely manner. In addition, it is said that the completion of a running order can take a long time and the data can be seen in the database that is used to record the time of the incoming order and the complete order, for the completion of the existing order can vary from minutes to hours, as for example for only 1 (one) Block order it can take about 1 to 2 hours or even more if there is an unidentified problem so it must be traced first and the fastest completion time is around 10-30 minutes. Therefore a new system solution is needed which can provide solutions to all the problems that exist today.

In this case, it is a project carried out between the vendor and the company as a client, in the proposal and contract stage, it has been agreed that there are 5 (five) functions / modules of the old system that will be moved to the new system, those functions between others are: Block, Unblock, Suspend, Resume, and Prepaid to Postpaid Migration, which can be called the Network and Billing Element Modification which of course as a whole is part of Customer Relationship Management (CRM).

In this case study, the construction of a new system will be carried out by upscaling / changing the functions of the ESB platform (Enterprise Service Bus) which was originally a facility for storing services [1] that will be used in a business process to become a means of orchestration in fulfilling the order management in the company, which will later be referred to as IOM (Integrated Order Management). In the construction of this new system, the architecture that will be used is SOA (Service Oriented Architecture) in which this architecture allows for the construction of a system that allows developers to be able to create a system that can be modified according to the functions desired by the client, of course to provide convenience in business processes go hand in hand with increasing system flexibility in responding to changes in service from clients [1], [2]. Of course by using this ESB, all existing services can be modified according to the wishes, and if there is a change in the backend side, only the service affected will need to be changed, there is no need to change all existing code, this is due to the ESB feature that provides the possibility to be able to change existing services according to company needs. What's more, because the services that will be

applied using the loosely coupled model, the entire system will consist of micro-services that can be changed according to need [2].

1.1. Case Study Problem

The related problems in this case study are as follows :

- The duration of an order took a lot of time, can be hours which will impact the business cases and also the business flows in the company, because the CRM division will be the most impacted.
- The success rate of orders in the system are not as expected by the management team, it is around 80~90% while the management expects 95~100% of success. The success rate also implies the errors that had to be fixed by the operational team which possibly by manual fixing.
- The system's capability of processing the orders need to be improved, as the performance is going down because the orders keep increasing.

2. RELATED WORKS

Previously, there are some researchers who are into the Ordering Management System (OMS), that is the system that we are going to replace, they also researched that instead of creating a whole system of OMS, it is better to create a system consisted of loosely coupled microservices. It is because the whole process and data required of order processing may change and will need another change from the system itself, so it is better to reuse services that are available, in-stead of building the system from the scratch because it will need a lot of time and resources. [3], [4]

To create the system that is consisted of microservices, it is best to create it using the SOA Methodology, because SOA itself is an architecture of a system that allows the developers to create a system of microservices. So, the services itself can be modified according to the client needs, this surely gives easiness in the business process of the client and also raise the flexibility of the system itself in accommodating the changing needs [1], [2], [5]. The development of the system itself will be consisted of loosely coupled services that are independent, as known as the microservices. The services that are created in 1 application enables the services to be accessed internally or externally. [2]

A research stated that by using services / microservices that are actually web services, the method of integration and communication will be using certain languages that are commonly used, such as using XML (Extended Markup Language) that is ruled by a certain policy called WSDL (Web Service Definition Language) which will define and rule the service to only accept the parameters and data according to the rules stated in the WSDL. The messages will also be enveloped by a wrap named SOAP (Simple Object Access Protocol) that is commonly used as a standard format. Other than direct call of web services, there is also a method of queueing messages which commonly called JMS (Java Messaging Service) this method will allow the messages to be stored in a place and then will be dequeued / consumed overtime by the time the messages inserted to the queue and usually this proses will be called asynchronous process, while the direct calling of service will be called synchronous process. It is also stated that the usage of SOA has been applied in telecommunication industry, but only for the OSS (Operation Sup-port System) that is used to serve the customers and arrange the activities for automatization of business process. And from the implementation, the usage of web services is highly recommended for integration between systems. [5]

3. PROPOSED SYSTEM DESIGN

3.1. Proposed Architecture

The proposed system is based on Enterprise Service Bus with Weblogic as the Application Server. The Architectural of the Infra-structure will be High Availability based, with a set of servers, in this case will be using a total of 16 servers. The host server will be running Linux Operating System. Figure 1 shows the system infrastructure that will be used.

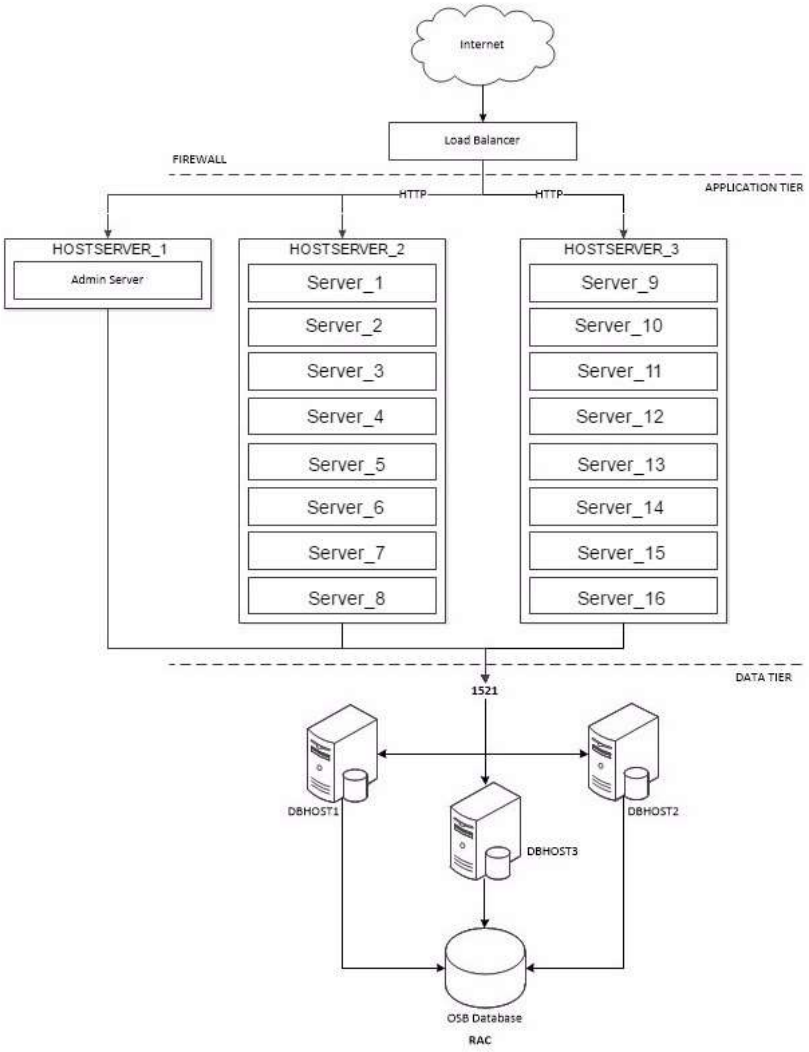

Figure 1. New system infrastructure architecture.

3.2. Proposed System Flow

The proposed system will have separate services that will handle the task, there are core service and also the supplementary services. The system itself is using the SOA which composed by the micro-services stored in the ESB. The core services will work as the orchestrator of the supplementary services. While the core services has the logic to orchestrate the orders to hit various backends, the supplementary services are meant for transforming the data and hitting / communicate and trade data to the backends which have various needs of data and also various methods of communication.

The request will come from the front end with the data that is to be orchestrated. Then the data will be sent to the core service, the core service will hit catalogue service which will

return a set list of backends that has to be hit by the data passed from the front end, the catalogue service itself will provide the parameters to be passed. The catalogue service will query data from the database and will return it as a sequences or work order. After receiving the work orders, the core services then will transform the request to XML message which is called runtime message that contains the data and work orders according to the sequences provided by the catalogue service. The data then passed to the supplementary services in sequence, so that the supplementary service will pass the data to the corresponding backends, and receive the response. After that the response will be received by the core services and the next set of data will be sent to the next supplementary services. This process will continue until all of the work orders in the runtime message has been completed.

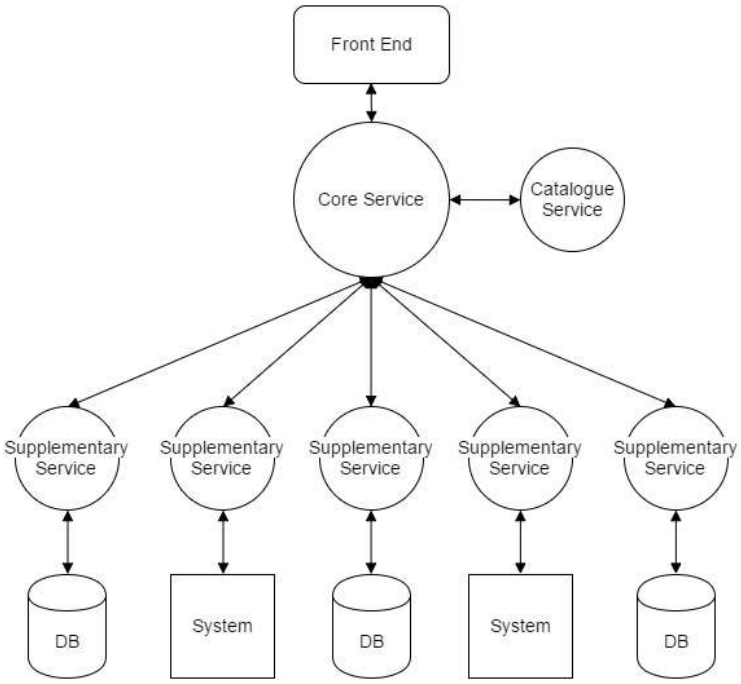

Figure 2. New system flow.

4. RESULTS AND DISCUSSIONS

The use of SOA and ESB has been widely used, it is being used in the telecommunication industry, such as in the network implementation and in the ordering process [5]–[9]. It is also being used in the supply chain management industry for a long time already [10]. The ESB product itself not limited to 1 company and their performance varies on different conditions [11]. Also, there are still some discussions about the best way of integration by using the Web Service, either using SOAP or using the REST method, both of them have their own advantage of use, but according to [12], it is said that REST has definite advantage over the SOAP style. Currently, the design of the core service still need improvement, as the payload being stored by the core service can be said that it is enough to cater the needs of orchestration, but the concern is that the size of the payload will affect the memory of the database.

The comparison of Success Rate between the legacy system based on Java code and the new system in a 7 days time (previous and now) :

Table 1. Comparison of legacy and new system.

	Legacy System (Previously)		New System (Now)	
	Success	**Errors**	**Success**	**Errors**
Block	68.172	6.196	76.947	2.348
Unblock	66.806	6.802	74.592	1.983
Suspend	68.128	5.507	70.129	2.027
Resume	69.924	7.319	78.973	3.184
Migration	51.728	6.178	51.839	2.166

The Success Rate of the orders have raised to an acceptable level by the management team. The errors that occurred in the new system are mostly caused by the surrounding, either data issue or the network issue. As for the errors that are caused by the system itself have been reduced.

5. CONCLUSIONS

The use of SOA and ESB in this case study can be possibly said being the best call to accommodate the need of telecommunication industry, because SOA and ESB itself are able to cater the ever-changing flow [4], [9] that is need to be done by the telecommunication, because as we already know that the industry will always have new products and also change their product configurations according to the customer needs and the competition between the companies that move in the same line of business.

The use of ESB in ordering, for this case can be called success, while the rate of success of the legacy system was 80~90%, the new system is able to fulfill the management's expectation of 95~100% of success rate. While there are still so many errors occurred, the errors are mostly caused by the surrounding system and the errors caused by the ordering system itself has been reduced to an acceptable number.

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